PATENT
Docket No. A241 1060.1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Confirmation No.: 4098

Application No.	:	10/628,579
Applicant(s)	:	Mark C. Carroll et al.
Filed	:	July 29, 2003
Art Unit	:	1742
Examiner	:	Morillo, Janell Combs
Title	:	5000 SERIES ALLOYS WITH IMPROVED CORROSION PROPERTIES AND METHODS FOR THEIR MANUFACTURE AND USE
Customer No.	:	59554

DECLARATION UNDER 37 CFR 1.132

Honorable Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

I, H. Scott Goodrich, do hereby declare as follows:

1. I have a B.S. Materials & Metallurgical Engineering from the University of Michigan, a B.S. in Nuclear Engineering from the University of Michigan, an M.S. in Metallurgical Engineering from the University of Michigan. I am an ASQC Certified Quality Engineer. I am a named inventor in 3 patents and I am an author on numerous publications and conference presentations. I have been working in Ravenswood, WV for 28 years in the aluminum industry at a large rolling mill facility currently owned by Alcan Rolled Products LLC. While working at the aluminum plant in Ravenswood, I have held the jobs of Process Metallurgist, (Casting, Hot Rolling, Plate, Cold Rolling) Product Metallurgist (Brazing Sheet, Plate, Can Stock, Marine alloys, TTDB)

Automation Engineer (5 stand hot mill moderization, cold rolling flatness control), Manager; Research & Development, Technical Director Vice President Technology / CI (Laboratory, Quality & Quality Systems, Process Metallurgy, R&D, Continuous Improvement, Intellectual Property Management). While working at Ravenswood, I have developed over a dozen alloys for use in the aerospace, automotive, heavy transportation or beverage can industries

2. I am familiar with the above-identified patent application ("the present application") in my capacity working as a metallurgist and manager at Alcan Rolled Products LLC and I was involved in the management of the research project from which this patent application was developed. I have reviewed documents associated with the present application including US Patent No 6,342,113 to Haszler et al.

3. The invention of the present application relates to a modified 5083 alloy that has been sensitized at a particular temperature. It was unexpectedly found that by so doing, a tau phase is created. Attached to this declaration is a set of phase diagram calculations showing the existence of the tau phase. These diagrams also show the decrease in the beta phase (the detrimental phase to corrosion resistance) as the tau phase increases.

4. As one of skill in the art, I am of the opinion that Haszler et al does not teach or suggest the invention of the present application for at least the following reasons:

According to Haszler et al., Zr is required to improve the properties (this is mentioned in the invention summary of Haszler et al.) and the improvement in corrosion resistance reported by Haszler et al. is because of the "precipitation of anodic intermetallics within the grains" as opposed to the grain boundaries when exposed to 100 degrees C. This is stated in example 3 of Haszler et al. when referring to the alloy D1 that has 0.13% Zr. Therefore, Haszler et al. teaches that "anodic intermetallics" are preferentially precipitating in the grains and therefore are not forming a continuous grain boundary precipitate. On the other hand, in the invention of the present application, no Zr is intentionally added and the quantity present is only that of a naturally occurring

trace element (ie less than 0.05%)

- According to the invention set forth in the present application, a completely different strategy than Haszler et al is employed. That is, the present invention relates to changing the nature of the precipitate at the grain boundary, i.e. the tau phase, so that it is not anodic to the matrix. It is my opinion as one of skill in the art that this phenomenon does not occur according to the Haszler et al. teachings.

- Haszler et al also has a minimum of 0.4 % Zn in order to precipitate Zn containing intermetallics at the grain boundaries. There is no mention by Haszler of precipitating the tau phase. In fact, Haszler et al states that Zn below 0.4% does not provide intergranular corrosion resistance. For an alloy of the present application, 0.3-0.6 % Zn is used, so it is clear that even values from 0.3-0.4% Zn will still produce the tau phase, whereas Haszler et al. teaches that anything less than 0.4% Zn would not work. This indicates Haszler et al. does not provide any motivation at all to produce a tau phase as achieved by the present application. Furthermore, in the present application, the addition of Cu is required (in conjunction with Zn) in order to produce the tau phase whereas Haszler et al do not recognize this. Thus the reason in my opinion why in their case Zn below 0.4% does not provide intergranular corrosion resistance

- Haszler et al requires at least 5.0 % Mg in order to obtain the required increase in properties. However, the present application employs the standard 5083 composition for Mg, namely, 4 -4.9% Mg. Again, this is a teaching away from the present invention by Haszler et al. A goal of the invention of the present application was to precipitate the tau phase at the grain boundaries and therefore improve corrosion resistance. This is not taught or suggested by Haszler et al.

- In the Haszler et al examples, the metal has a final annealing temperature of 250 deg C which is above the sensitization temperature. The invention of the present application employs 80-200 degrees sensitization. Again, a teaching away.

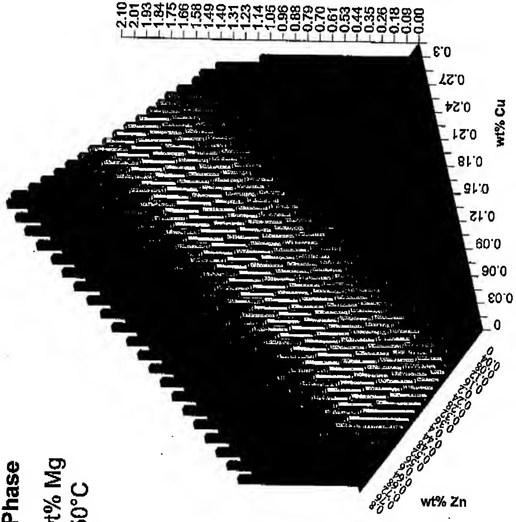
5. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

H. Scott Goodrich 6/20/07

H. Scott Goodrich Date: 20 June, 2007

Tau Related Phase Diagrams

- All fraction are in vol %
- They are equilibrium value using ProPhase

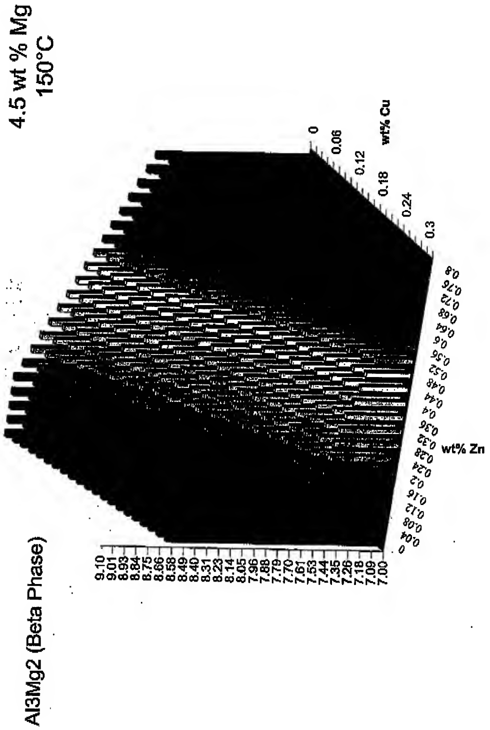


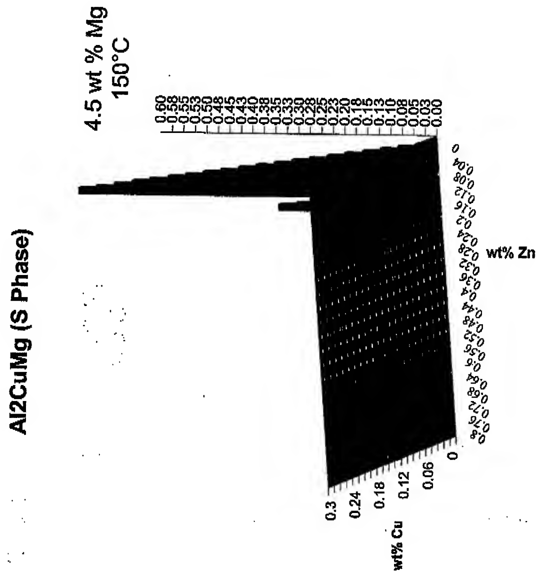
Tau Phase

4.5wt% Mg

150°C

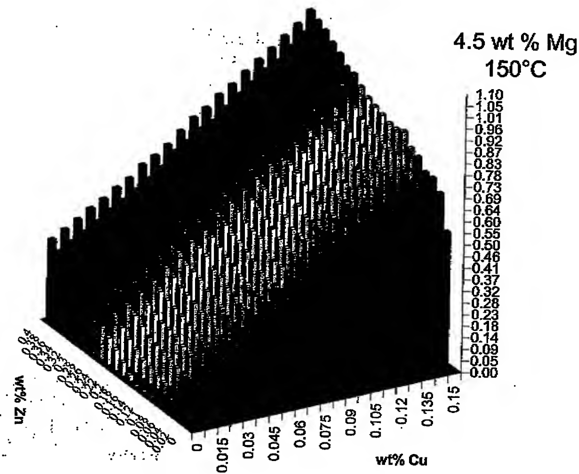
7

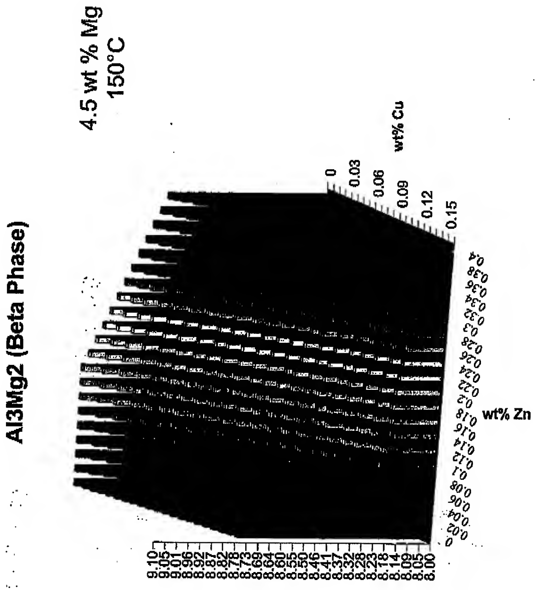

4.5 wt % Mg
150°C
Al3Mg2 (Beta Phase)
wt% Cu
0
0.06
0.12
0.18
0.24
0.3
wt% Zn
0
0.04
0.08
0.12
0.16
0.2
0.24
0.28
0.32
0.36
0.4
0.44
0.48
0.52
0.56
0.6
0.64
0.68
0.72
0.76
0.8
9.10
9.01
8.93
8.84
8.75
8.66
8.58
8.49
8.40
8.31
8.23
8.14
8.05
7.96
7.88
7.79
7.70
7.61
7.53
7.44
7.35
7.26
7.18
7.09
7.00

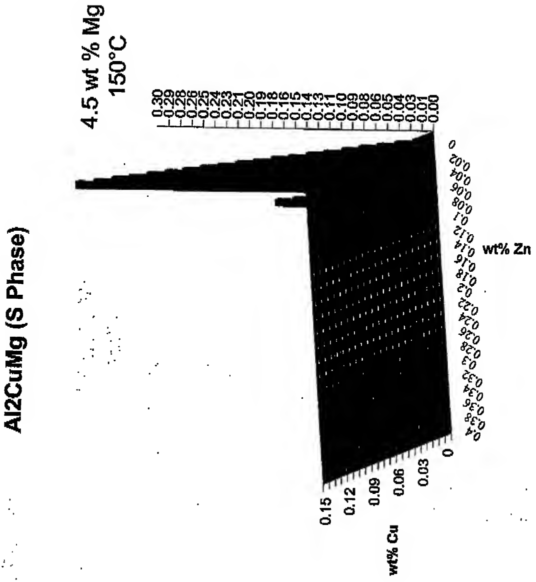

Al2CuMg (S Phase)
4.5 wt % Mg
150°C
0.60 0.58 0.55 0.53 0.50 0.48 0.45 0.43 0.40 0.38 0.35 0.33 0.30 0.28 0.25 0.23 0.20 0.18 0.15 0.13 0.10 0.08 0.05 0.03 0.00
0 0.04 0.08 0.12 0.16 0.2 0.24 0.28 0.32 0.36 0.4 0.44 0.48 0.52 0.56 0.6 0.64 0.68 0.72 0.76 0.8
wt% Zn
0 0.06 0.12 0.18 0.24 0.3
wt% Cu

Change of scales....

Tau Phase

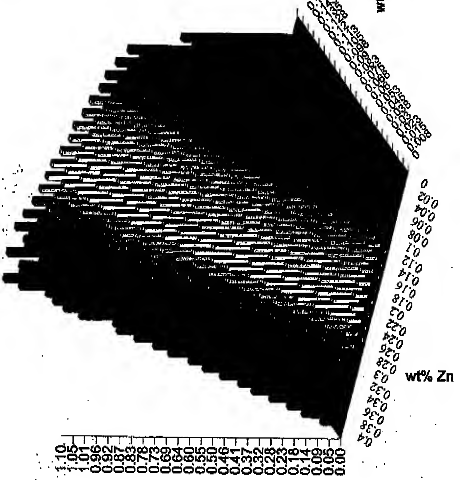


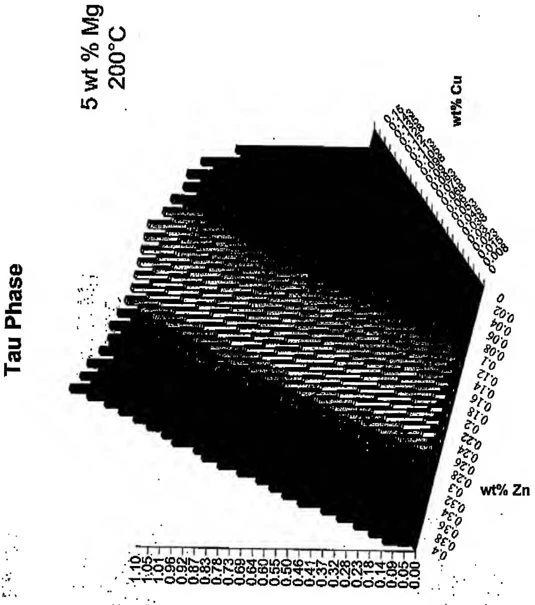

Al3Mg2 (Beta Phase)
4.5 wt % Mg
150°C
wt% Cu
0
0.03
0.06
0.09
0.12
0.15
wt% Zn
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
0.22
0.24
0.26
0.28
0.3
0.32
0.34
0.36
0.38
0.4
9.10
9.05
9.01
8.96
8.92
8.87
8.82
8.78
8.73
8.69
8.64
8.60
8.55
8.50
8.46
8.41
8.37
8.32
8.28
8.23
8.18
8.14
8.09
8.05
8.00


Al2CuMg (S Phase)
4.5 wt % Mg
150°C
0.30 0.29 0.28 0.26 0.25 0.24 0.23 0.21 0.20 0.19 0.18 0.16 0.15 0.14 0.13 0.11 0.10 0.09 0.08 0.06 0.05 0.04 0.03 0.01 0.00
0 0.02 0.04 0.06 0.08 0.1 0.12 0.14 0.16 0.18 0.2 0.22 0.24 0.26 0.28 0.3 0.32 0.34 0.36 0.38 0.4
wt% Zn
0 0.03 0.06 0.09 0.12 0.15
wt% Cu

Tau Phase

5 wt % Mg
85°C




Tau Phase
5 wt % Mg
200°C
wt% Cu
wt% Zn
0
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2
0.22
0.24
0.26
0.28
0.3
0.32
0.34
0.36
0.38
0.4
1.10
1.05
1.01
0.96
0.92
0.87
0.83
0.78
0.73
0.69
0.64
0.60
0.55
0.50
0.46
0.41
0.37
0.32
0.28
0.23
0.18
0.14
0.09
0.05
0.00